CANADIAN ARCHITECT AND BUILDER.

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—THE—
CANADIAN ARCHITECT AND BUILDER,
A Monthly Journal of Modern Constructive Methods,
(With a Weekly Intermediate Edition—The CANADIAN CONTRACT RECORD),
PUBLISHED ON THE THIRD SATURDAY IN EACH MONTH IN THE INTEREST OF
ARCHITECTS, CIVIL AND SANITARY ENGINEERS, PLUMBERS, DECORATORS, BUILDERS, CONTRACTORS, AND MANUFACTURERS OF AND DEALERS IN BUILDING MATERIALS AND APPLIANCES.
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EDITOR'S ANNOUNCEMENTS.
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NOTICE OF REMOVAL.

On or about the 20th of September, the publication offices of the CANADIAN ARCHITECT AND BUILDER will be removed to the new Confederation Life Association Building, corner of Yonge and Richmond Streets, Toronto.

IN connection with the publication of the competition design for a suburban house in our last issue, we omitted to print the name of the author, Mr. W. Ford Howland, Toronto.

THE project for connecting Prince Edward Island with the mainland by a sub-marine tunnel is assuming practical shape. At the last session of Parliament, $12,000 was appropriated to cover the cost of making preliminary surveys. Borings for the approaches on the island have already been made, and the character of the rock is reported to be favorable for tunnelling.

PUBLIC recognition of architectural ability is of rare occurrence. An instance of such recognition, however, is at present seen in the determination of the trustees to place in the library of Cornell University a portrait in oil of the architect of the building, Mr. W. H. Miller. The painting of the portrait has been entrusted to a Canadian artist, Mr. J. C. Forbes.

THE members of the Chicago Architectural Sketch Club have been invited to submit designs in a competition for a permanent memorial monument to the late J. W. Root. The memorial is to cost $15,000, and is proposed to be erected in Jackson Park. In view of Mr. Root's ability as an architect, and his popularity, especially with the younger members of the profession, this competition should awaken much enthusiasm, and call forth the best efforts of which the members of the Club are capable.

A SYNDICATE, in which some Toronto persons are interested, has been formed to manufacture steel by what is known as the Hastings process. The surprising claim is made that by means of this process structural and cast steel adaptable for all purposes can be manufactured from pig iron at a cost of a few cents per ton. Such a discovery might be expected to give an impetus to iron production in Canada and greatly cheapen the cost of the construction of large buildings in which iron and steel are so largely employed.

REFERRING to the death of the late W. T. Thomas, of Montreal, the *American Architect* states that he was "still in the prime of his usefulness, being only sixty-four years old at the time of his death," and adds, "but our harrassing and poorly-paid profession does not favor longevity in those who practice it, and we can perhaps hardly say that he was too soon released from his anxieties." Without disputing the fact that the practice of architecture is usually attended with many vexations and much mental anxiety, it nevertheless appears to us anomalous that our contemporary should have selected as an example of the effect of these influences one who had almost attained to the allotted three score years and ten. It should be borne in mind that the men who live beyond sixty years, are largely in the minority.

THE Toronto City Council has foolishly allowed the opportunity to pass of securing, at a moderate cost, the enlargement of the space for traffic at the corner of King and Yonge streets. The owner of the old building on the north-east corner has recently replaced it by a new structure, which, although not of an

expensive character, will add perhaps $15,000 to the cost of the site. Since the erection of this building, which is five or six stories in height, the lack of space at this point has become more than ever noticeable, and an idea can easily be formed of the condition of affairs which will exist when a similarly tall building shall have taken the place of the low one at present occupying the north-west corner. There is no wiser step that the Council could take on behalf of the city's future than to still endeavor to provide for the carrying out of this improvement, even at the extra cost which the erection of the new building to which we have referred would entail.

THE architects of Australia are to be congratulated upon the announcement recently made that the law compelling registration, for the passage of which the leading men in the profession have been laboring for some time past, will be introduced as a Government measure on the opening of parliament. Under these circumstances its passage in some form may be considered assured. On the other hand we regret to observe that the bill providing for the registration of architects in the state of New York, after having passed the legislature, has been disallowed by the Executive, in compliance with the petition of five New York architects, none of whom are members of the American Institute of Architects, or have attained to distinction in their profession. It is not a matter of wonder that the decision of the Executive has awakened a feeling of indignation on the part of the professional press and of those who have put forth unremitting efforts on behalf of the measure.

THE principal business thoroughfares of Toronto are being torn up to permit of the laying of companion water mains and permanent pavements, and the putting down of tracks for the electric street railway. The excavation, close beside the fashionable promenade on King street, let loose into the atmosphere noxious gases and foul odors to such an extent as to cause pedestrians as far as possible to avoid the locality. The underground conditions thus revealed are not pleasant to contemplate. The earth appears to be completely saturated with illuminating gas and other substances which are continually being discharged from defective mains. These substances, so deleterious to health must find their way into the atmosphere of the streets, and into cellars, where the results are still more harmful. Another thing which a glance into these excavations suggests, is the liability of frequent accidents to the network of pipes buried beneath the surface of the streets. It seems almost too much to hope that the permanent pavements which are about to be constructed will remain long undisturbed.

UNUSUAL dullness prevails in the building trade in Toronto, the result to a large extent of operations having been carried on for several years past on much too large a scale. Hundreds if not thousands of houses were erected by speculative builders in advance of the demand. Many of the houses so erected in the expectation of a speedy sale, were put up in a most unsubstantial manner, and by the time the population shall have increased sufficiently to create a demand for new buildings, will have become scarcely habitable. The work under way and in prospect is principally of a commercial character. Many of the large structures, such as the Confederation Life Association building, the new University buildings, Victoria College, Ontario Legislative buildings, etc., which employed much labor and material, are nearing completion. It is to be hoped that the services of the workmen on these structures will be in demand for the proposed union railway station, the new city buildings, drill shed, etc. It is also to be hoped that the proposal to erect a first-class hotel will soon assume tangible form. The city is much in need of such an hotel, and whoever may carry out the undertaking will no doubt receive ample return from the capital invested.

THE architects of Germany have appointed a committee to arrange an architectural exhibit for the World's Fair. About two hundred of the most meritorious buildings in all classes erected during the last decade have been selected by a competent jury, and special invitations sent to the architects of the same to forward the necessary drawings. The Government will defray all charges for transportation, insurance, etc. December has been fixed as the time when all drawings for the exhibit must be ready. The attention of Canadian architects was recently called to the importance of taking immediate action to insure a creditable exhibit of Canadian work. Our German friends, who are generally supposed to move more deliberately than the people of this continent, are at least far ahead of us in this matter. The influence of their example should cause us to awake from our seeming lethargy and act promptly in a matter of such importance. Why should not committees be at once appointed by the Associations of Ontario and Quebec to deal with this matter? Since the above was written we have received from the Secretary of the Committee on Congress of Architects a request for the names of members of the Canadian Associations of Architects. It is intimated that the names of architects throughout the world are being collected preparatory to issuing a call for an Architectural Congress to meet during the Columbian Exposition. The practical objects of the congress are stated to be to bring the leading architects of the world into fraternal relations for mutual acquaintance and the promotion of their mutual interests, to review the progress of architecture in different countries and by a comparison of results attained promote the general advancement of the profession of architecture throughout the world; and to consider the principles of architectural art and the relations of architecture to the other arts, sciences and industries.

THE destruction a second time of the city of St. John's, Newfoundland, will, it is to be hoped, lead to the erection of buildings of more substantial character, capable of resisting to some extent the action of fire. The greater part of the city having been built of wood, it was impossible for the few substantial buildings to withstand the intensity of the flames on every side. We are informed that the fire protective service was sadly inefficient, but the most perfect system could be of little value when once fire had got possession of a street of wooden structures. St. John's being the only city in the colony was the site of a number of costly public buildings, most of which were destroyed. Among these were the Government House, erected at a cost of a quarter of a million dollars, legislative buildings, custom houses, hospital and market buildings, court-house, chamber of commerce, commercial bank, Temple Club house, Masonic Temple, Athenæum Buildings, Methodist college, St. Andrew's church, and the two great cathedrals, Roman Catholic and Episcopalian, which are said to have cost in the neighborhood of $1,000,000. From the *Building News* we learn that the latter of these cathedrals had been some five and forty years in course of erection in sections. The original designs were prepared in 1847 by Sir Gilbert Scott, and the nave was then erected. In 1880 the next step was taken, when the choir and transept were built by masons sent out from England, under the direction of Mr. Gilbert Scott, to whom was entrusted the completion of his father's designs. The whole of the freestone was exported from Scotland. At the time of the fire the cathedral consisted of a nave with aisles of six bays, lighted by a single lancet headed window in each bay of the aisle and clerestory, and a western narthex; projecting transepts and a square-ended choir of four bays, this eastern work being of fully developed Decorated character, and provision was made for a future central tower, 35 feet square with broach spire. The styles were purely worked out, the whole effect being simple and bold. The Bishop of the diocese is soliciting funds in Canada and Great Britain to aid in the reconstruction of the edifice. A similar appeal is being made for funds to rebuild the Methodist college. The total insurance on property destroyed is understood to amount to about $6,000,000. Some of our architects and builders who are not at present overburdened with work might find in St. John's a profitable field for their energies.

THE crowds of busy citizens who throng our business streets suspect but little, if they think of them at all, the dangers that are near them through the insecurity of many old buildings, arising from careless and cheap construction in the first place, weakened by the hand of time. And generally it is not until some alterations to existing premises, such as tearing out of shop fronts for the purpose of putting in larger windows, are taken in hand, that the real truth concerning these structures, is exposed to view. But every now and then we are startled by the exposure, and we wonder where our building inspectors are,

that they do not warn off the foot passengers and insist on a protecting hoarding. There is this to be said against a hoarding, namely, that it would not be of very much use if the buildings in question chose to come down with a run. A short time ago on King street opposite the cathedral, Toronto, the cornice and freize of an old shop front was removed, and behind it was discovered, not the usual horizontal beam, but a laminated beam cambered to a foot or fifteen inches and tied in with a tie rod at the feet. Whether any test was applied or not to the tie rod, which was in place for a number of years, we do not know, but we are inclined to think not. In a couple of weeks, a two-story brick wall was built on the top of the "beam." Every one knows that the rust gets at iron, even under paint, and we are inclined to question very much whether, if the houses on either side of the one in question were removed, the cambered beam would be held in by the rod. We should expect to see it "kick," and the whole construction descend. At the time of writing there is an exposure of even more alarming character, because absolutely unaided in its ability by neighboring buildings, this is where a shop front has been removed on the north side of King street between Toronto and Yonge streets. Here we see a 12″ × 12″ beam of about 18 ft. long, with one end resting not more than 2″ in a brick wall, and that not on a plate or cushion, but upon a single brick; the other end of the beam is not seen. Two 4″ iron columns support the beam at say 5 ft. or 6 ft. intervals, and on the top of the beam is some of the roughest brickwork, laid anyhow, some bulging out to the street, some canted, and all apparently loose, which description answers also to the pier into which the end of the beam is supposed to be "built." Over this miserable brickwork rises two stories of better brickwork, but although the danger is so excessive and so apparent, nothing is done day after day to prevent what may perhaps be a serious calamity. There is a tie rod running at right angles from the end of the beam through about eight joists set parallel with the beam, which appears to have its end in a trimmer arch, but there can be no great help expected from this tie rod, as it is passed through the joists on a curve and is not by any means tight. No doubt now that the discovery of this weakness has been made, its defects will be remedied, but how about those buildings concerning which no alterations are contemplated? Surely these exposures should warrant our inspectors making an examination of all our old buildings, which, so far as we can see, is the only way to avoid some serious accident. The need of a vigilant system of inspection has been further emphasized since the above was written by the falling in of the roofs of a row of five houses on Florence st., Toronto, on July 30th. Only three of the houses were occupied,and fortunately the inmates escaped with but slight injuries.

PROVINCE OF QUEBEC A. O. A.

The annual meeting of the Province of Quebec Association of Architects will take place in Montreal on Thursday, the 29th of September.

The following are the names of the successful candidates in the recent examinations of the above Association: L. Lemieux; Fred. Loomis; M. W. Hogle; D. MacFarlane.

TEMPERING STEEL TOOLS FOR STONE WORK.

The matter of tempering drills and other tools for stone work is one of so much interest to quarrymen, that we may be pardoned for giving at length the very able paper on the subject presented by the *Northwestern Mechanic*. We add to it only this advice, "Stick to a single brand of steel," and let your blacksmith get thoroughly acquainted with its properties. There may be several brands of equally good steel, but they must be worked separately, and with a full knowledge of their peculiarities. That failures occur are more often due to the peculiarities of the steel than to the ignorance of the blacksmith, and if the blacksmith is ignorant in a specific case, it is because he cannot know the properties in every brand of steel. However the article contains its own comment:

In sharpening drills for stone work, the first thing to guard against is not to heat the steel too hot. All the books treating upon this subject say, "never heat above a cherry heat." This is certainly a safe rule to work to, but it does not apply to all varieties of steel. Some kinds will bear heating to a bright red heat, and still others will bear a yellow color without detriment to the metal. In all cases the steel should be worked as hot as it will bear, notwithstanding the old advice "to forge at as low a heat as possible." The forging should be done at as high a heat as the steel will bear, but the finishing should be done at a very low heat, and it is better to hammer the drill until the heat is out of sight and the metal becomes black. For such hammering the blows should be light, and very little drawing of the metal should take place. Heavy blows upon a cold or nearly cold piece of steel will cause the particles of the metal to move over each other, ending in disintegration of the metal.

Cracks often develop after steel has been hammered too cold, or rather after it has been hammered too much while nearly cold.

Suppose that a common ½-inch drill is to be made for use in making holes for plug wedges. Select a piece of ¾-inch octagon steel; cut off a piece 24 inches long, which is just enough to make two good drills. Heat one end of the piece for about six inches in length, drawing it down to ⅝ of an inch; then hammer it octagon, and still further reduce to a little over one half inch. A swage should next be placed upon the anvil, the drill placed therein and operated upon by a top swage and sledge hammer. Draw down to a little more than ½ inch. Take care to make a fine taper at the point where the octagon shape merges into the round part of the drill. This taper should be about two inches long. Take care that the round part of the drill is exactly central with the large part; an overcast at this point will result in making a poor tool. All instruments to be used by percussion must be perfectly straight from one end to the other, otherwise they will spring when struck by a hammer, and a large portion of the force of the blow will be lost, to say nothing of jarring the fingers of the operator and the damage to his temper.

The drills should now be about 18 inches long, 6 or 7 inches of one end being octagon, 2½ ins. taper and 9 or 10 ins. ½ in. in diameter, and round. After finishing as many drills in this manner as it is desired to make, allow them to cool slowly; under no pretence whatever quench them in water or let them lie upon an iron surface while cooling. It is best to throw them upon the coal and dust on top of the forge, or, if it is desired, stick them into dry dirt and ashes in any convenient place.

To sharpen the drill, hammer one inch on one end of the drill to a square section; then flatten out to a flat point, so that the bevel will be about 1½ inches long. Hammer the edges frequently, so that the drill will not spread in width. Upset the end of the drill occasionally so that it asumes and retains a slight diamond shape when drawn down to 1/16 of an inch in thickness at the extreme point; the corners of the drill will be about 1/12 of an inch in thickness. Revolve the drill upon the anvil so that one side of the diamond-shaped end lies true with the outer face of the anvil. With light, true blows thin this side of the diamond point down to 1/16 of an inch, allowing the drill to spread sidewise at the same time. Treat the other side of the drill in the same manner, and after a little truing up of the edges of the drill, it has assumed a correct shape and is ready for hardening.

Heat about two inches of the drill to a dull red; for some steel the cherry red will be sufficient, but other varieties require a little more heat Heat slowly so that the heat is uniform and the color alike all over the heated portion. Lower the drill slowly into a pail of cold water, the point first, and do not hold the drill still for an instant while it is in water. If two inches of the end have been heated, lower the drill into the water about one inch, passing it down slowly and steadily as stated; the end of the drill will then be as hard as "fire and water can make it."

Remove from the water immediately after it has reached the desired depth and polish by rubbing upon a piece of board, on top of which a little sand or dirt has been sprinkled. The polishing process is merely to allow the color to be seen as the temper runs down from the heated portion of the drill. During the drawing process, skill and judgement are the only guides to obtaining a drill that is just hard enough to do the work, and not hard enough to break. The color necessarily varies with different qualities of steel. The steel that will not bear heating harder than a cherry red must have a temper drawn to a purple or blue color. Steel that stands a higher working temperature will stand a straw color for temper and perhaps even lighter.

The instant that the red color is noted the drill must again be plunged into the water.

ILLUSTRATIONS.

PORTRAIT OF THE LATE W. G. STORM, R. C. A.

BANK OF MONTREAL, WEST END BRANCH, MONTREAL—TAYLOR & GORDON, ARCHITECTS, MONTREAL.

PROPOSED HOUSE, VANCOUVER, B. C., FOR MR. O. G. EVAN THOMAS, ESQ.—FRIPP AND WILLS, ARCHITECTS, VANCOUVER.

This picturesque country house is to be a frame-built structure, covered with shingles, and to have leaded light windows in large square. The roof timbers will be stained dark to match teak ; the mantelpieces, and internal finish generally, to be made of teak, imported from the east and made there. The cost will be about six thousand dollars ; but as houses are usually finished in Vancouver, the cost would, perhaps, be only some five thousand dollars, which seems very cheap for a house of this size.

This is one of the cases in which the plan arrangement is very much due to the client, the particular arrangement here shown having been laid out by Mr. Thomas's own suggestion in every particular. The large galleried hall, with its encircling gallery and lookout recess over the porch, will be a very pleasant feature if in bad weather it is kept warm and free from draught.

The description and illustration are reproduced from a recent number of the *British Architect.*

PRESBYTERIAN CHURCH COMPETITION—DESIGN BY "JOHN NOX" (MR. A. E. WELLS), TORONTO, AWARDED FIRST POSITION.

The instructions to competitors for the class in which this design was submitted called for a country church to seat from 150 to 200 persons, with one room to be used as vestry and library ; and the building to be heated with stoves.

This is a design for a wooden building with a stone base to the height of the window sills. Externally the walls and roof are intended to be covered with shingles and left to be stained by rain and weather. Internally it is purposed to treat the roof entirely in wood and the walls to the height of the window sills with a moulded wood dado ; the remainder of the wall space to be plastered, the brown plaster to be straightened and the walls finished without the usual white coat. All internal woodwork not exposed to handling is intended to be oiled merely, and left to turn richer in color with age. It is estimated that this design would cost in execution from $2,500 to $3,000.

TORONTO BUILDERS' EXCHANGE.

On July 27th, the members of the Exchange, together with their friends, about 325 in all, took a trip to Olcott, N. Y., on the "Carmona," leaving Geddes' wharf at 8 a. m., and returning at 9:30 p. m. The weather was all that could be wished for. The excursionists, for the most part, appeared to better appreciate quiet discussion in the shady park, than amusement requiring much exertion, as the temperature was "away up." The return passage was made very pleasant by the cool breezes of the lake and by a musical entertainment under the able direction of Mr. J. Lester Nicholls.

The excursion is the first venture of the kind since the Exchange was organized, and the success of the experiment will probably induce the members to make it an annual "institution."

PERSONAL.

F. M. Rattenbury, architect, has opened an office in Vancouver.

Mr. Copping, Building Inspector, Toronto, recently received serious injury by falling from a street car.

Mr. Louis Coste has received the appointment of Chief Engineer of the Public Works Department of Canada.

The Toronto Plate Glass Importing Co., their employees and friends, enjoyed their annual excursion and picnic on the 6th inst. Their objective point this year was Galt, Ont.

Mr. Arthur E. Wells, Secretary of the Toronto Architectural Sketch Club, a young man of marked ability, is about to leave Toronto to take up his residence and pursue the study of his profession in New York. The best wishes of many friends for a prosperous future will accompany him.

A PLEA FOR PERFECTION IN BRICKWORK.

The perfect in building construction may be said to be reached when there is obtained a maximum of strength and durability at a minimum cost. To design a roof, a floor or a wall that shall be strong enough to carry the load to be placed upon it, and strong enough to resist the thrusts that may be put upon it, is simple enough ; the problem is to design in such a way that the portion of the structure is exactly strong enough and no stronger than is required ; in other words, that there is no waste.

Having these facts in mind, it is easy to understand why there is so great a difference between carpentry in the United States and in England, and some parts of Europe. In this country timber is cheap and labor comparatively dear, while in England the reverse is true, and labor is cheap and timber comparatively dear. Adding the expense of freight to American timber used there, the cost will be somewhat more, while labor costs in round figures only about one half of what it does here. These facts affect and regulate construction to a very great extent, and what would at first appear to an English carpenter faulty and wasteful construction, is simply the result of a desire to save time ; in other words, material is sacrificed for saving of labor.

These facts are equally true as far as brick construction is concerned, and it it is doubtless due simply and only to the desire to save time that the imperfect, faulty, and altogether wasteful method of laying bricks in "running" or "American bond" has come into general practice. It has been suggested in these columns that the fact of face bricks being of a different size to those on the interior of the wall is responsible for the use of the bond, but the writer thinks that this does not by any means explain it all, although it may to some extent. There is no reason in the world why the back of a wall, whatever the sizes of faces and back may be, should be laid in running bond.

Now, in the construction of buildings as in other things, it is often profitable to closely and critically examine the methods followed elsewhere to ascertain whether they may not be adopted with advantage here. It is certain that no part of a building deserves perfection in construction, so to speak, so well as does brickwork, and this for the simple reason that no portion is less liable to decay. The best bricks, and this litterally means bricks of the highest quality, are exceeded in durability by no known material used in the construction of buildings. Iron rusts ; timber decays ; stone perishes, and if it be limestone is destroyed quicker than timber ; but good brick resists the action of atmosphere, fire and water, and lasts for ages. The very strength and durability of brick have been the cause of poor brickwork, paradoxical though it may seem.

To construct a brick wall that shall be as strong as possible from the material at hand would appear to be eminently desirable, but a wall erected in running bond falls short of this.

This is not difficult to understand. The system of construction violates the most important principle of bonding which is, that no two vertical joints shall come over one another. Suppose that there were no consideration of appearance, why not pile the bricks up one upon the other irrespective of bonding? "Oh," the bricklayers will tell you, "we must get bond,"—he must interlap the bricks to get bond,—to get strength on the face of the wall. Why not get bond through the breadth of the wall as well? That there is a necessity for it will not be denied, for the whole weight of the building rests on the inside portion of the wall, and it is of the utmost importance to distribute this weight through the thickness.

That which comes nearest to a perfect wall is that system of construction knows as "English bond," in which the bricks are all laid headers, excepting at the face, in alternate courses, when they are laid stretchers. This system of construction produces a wall in which the fundamental principle of bond is closely adhered to, and it will be found that, when it is faithfully carried out, no two mortar joints, in any part, come over one another. Flemish bond, although less perfect from a constructional point of view, is very considerably stronger than running or American bond, while its appearance is generally acknowledged to be very much superior.

Now, while the strength of a wall erected in English bond is very considerably stronger than one built in running bond, it is a fact to which due regard must be paid that the latter effects a saving of time. But while it is true that running bond can be built somewhat quicker than English, the writer

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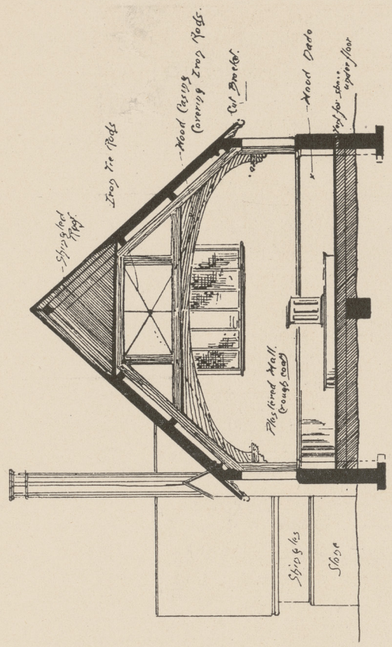
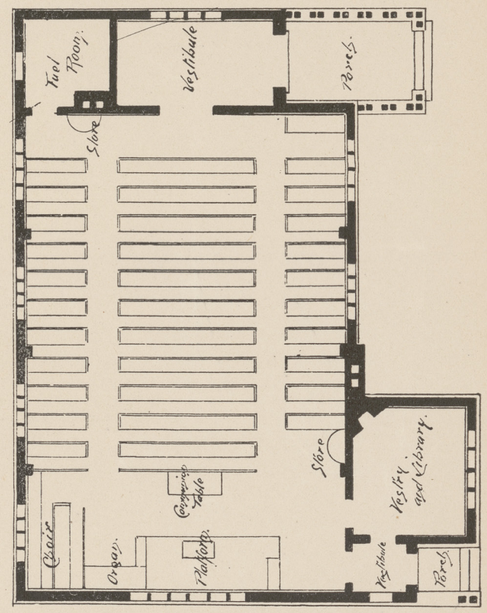
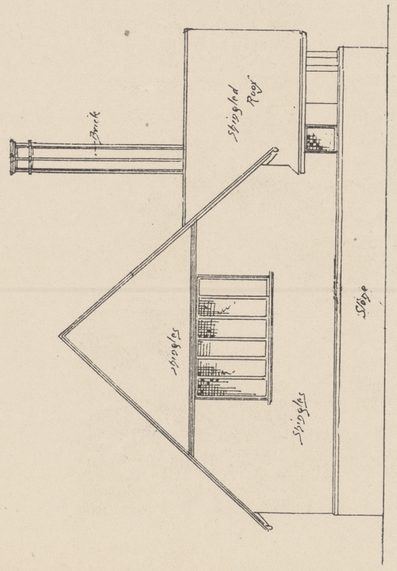
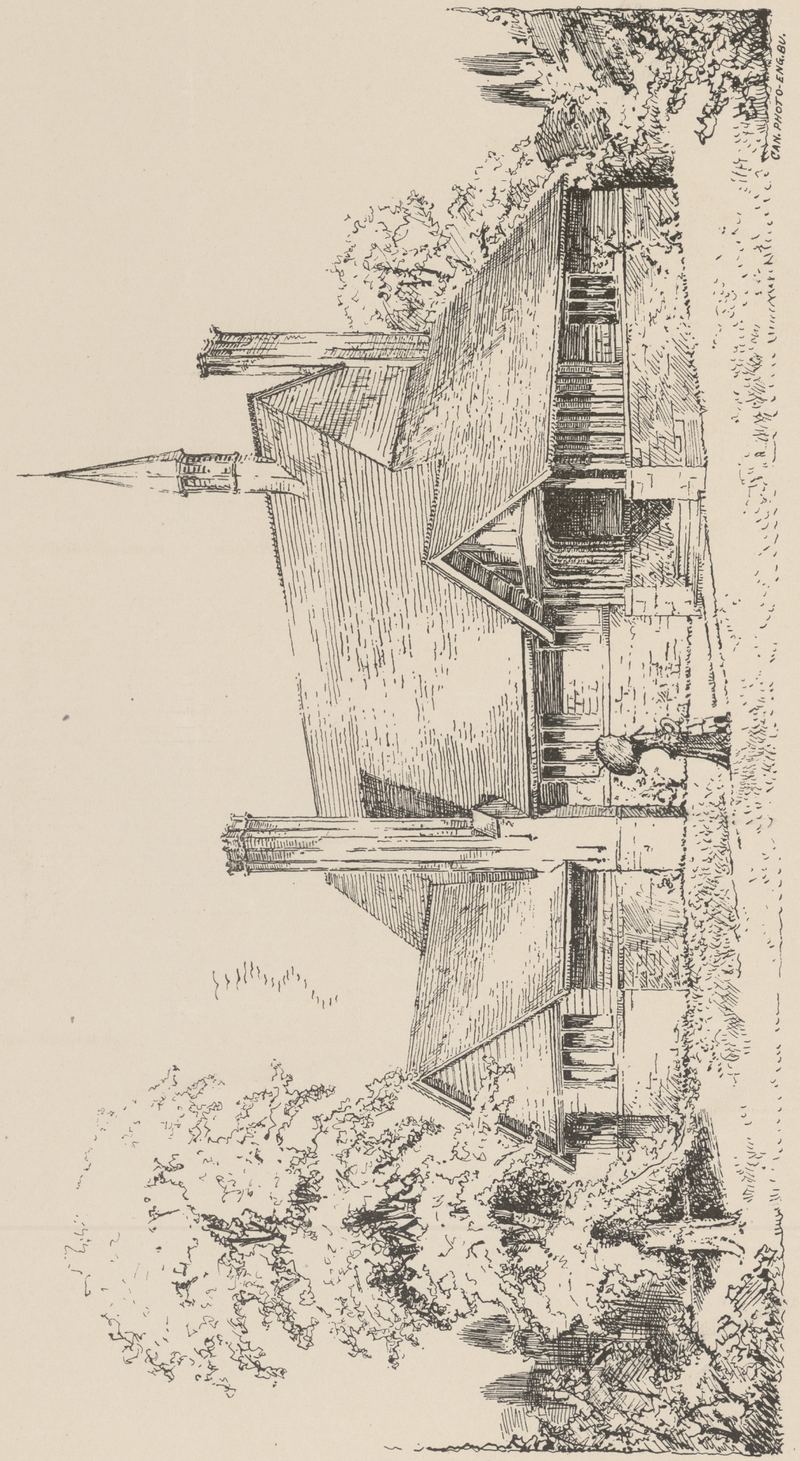


Interior Elevation



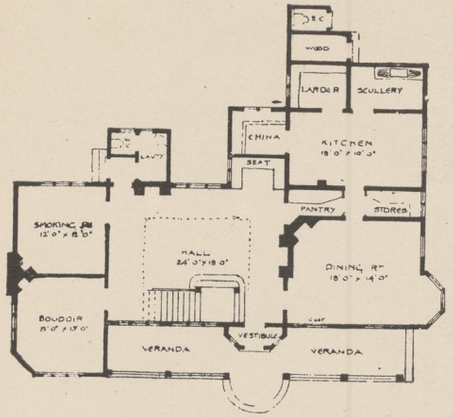


Elevation of End.

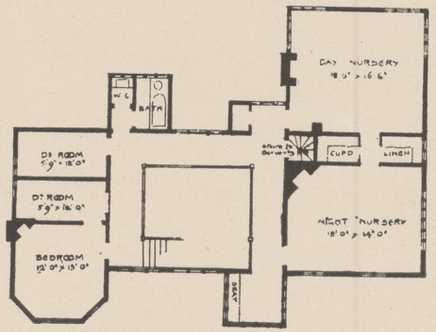


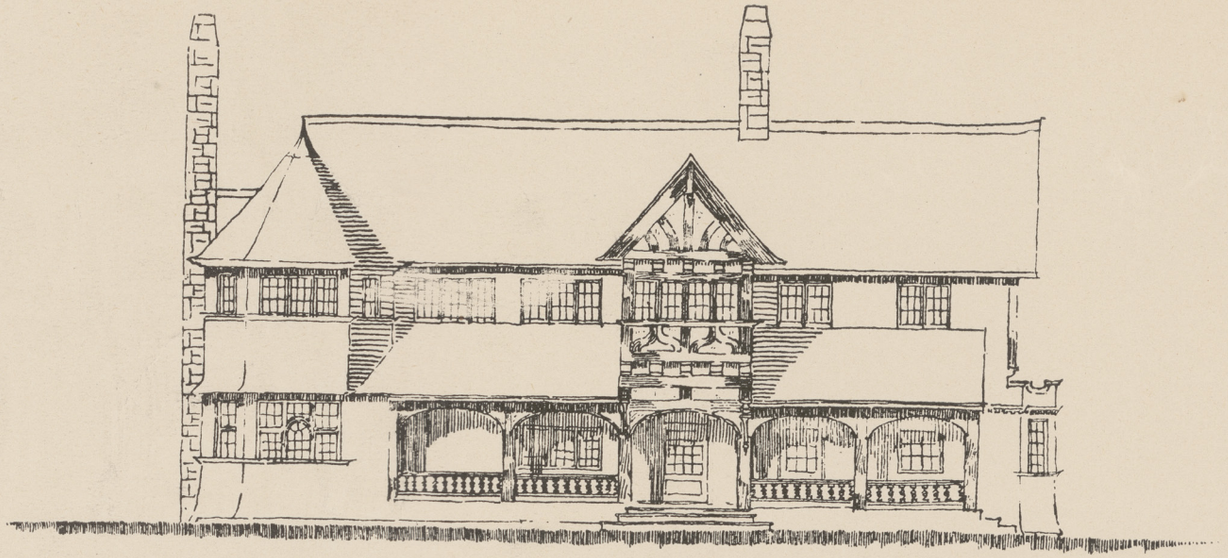
Presbyterian Church Competition.

Design Submitted by "John Nox." (Arthur E. Wells) Toronto.

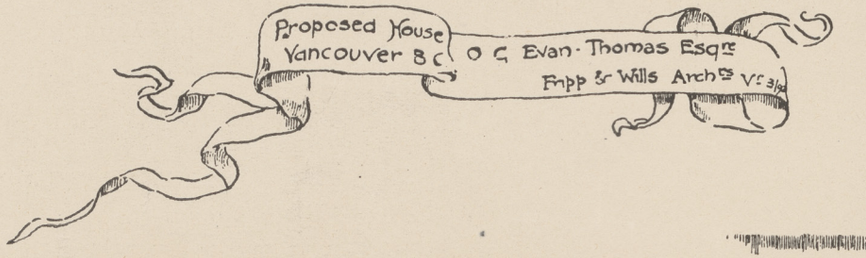


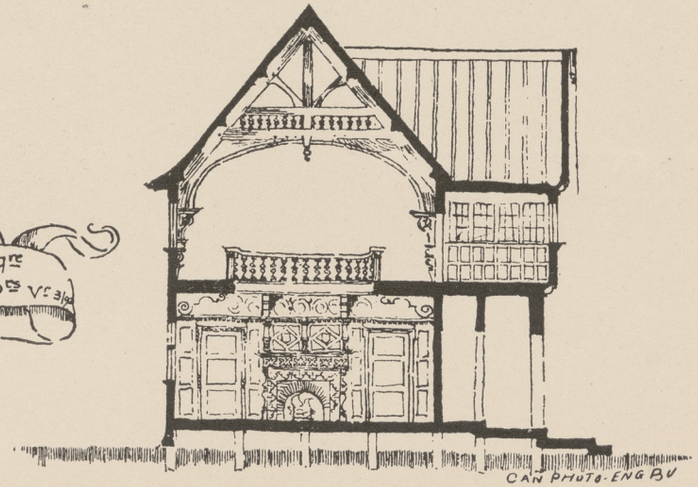
GROUND FLOOR





FRONT ELEVATION





CAN PHOTO-ENG BU

SECTION ACROSS HALL

BANK OF MONTREAL
WEST END BRANCH
MONTREAL

TAYLOR and GORDON
ARCHITECTS
MONTREAL

claims that the advantage gained in this respect is so small as to be altogether inadequate to compensate for the great decrease in strength. It may be added, that, when he has urged architects to specify English and Flemish bond, he has been told that builders would refuse to construct them without an exorbitant increase of cost, being actually bound by the journeymen bricklayers to lay only the system of bonding they have been used to. This idea is doubtless exaggerated because no small porportion of working bricklayers are foreigners and are well acquainted with the correct methods of laying English and Flemish bonds.

But whatever bond is used in the construction of walls, there are certain other points of importance that are only too frequently overlooked. The first of these that may be mentioned is "damp courses." In Europe the use of damp courses is rendered compulsory by the building laws in most large cities. A damp course, if constructed of proper materials, is absolutely effectual in preventing the rising of moisture by capillary attraction from the earth and the consequent dampness of the walls.

"How to cure damp walls," is a question that is propounded to the architects' and builders' journals very frequently by house owners and others who are suffering from this trouble, and who not infrequently state that they have tried the application of various kinds of paint to the surface of the walls with the only result of driving the moisture higher up the wall. In such cases an effectual remedy may be found in inserting damp courses throughout the wall, underpinning it as may be necessary, although, of course, the damp course should have been inserted when the wall was built.

A good damp course may be constructed of three layers of common roofing slates, laid in cement with the joints lapping, the edges of the slates projecting to about an inch or so beyond the side of the wall. The damp course, of whatever kind it is, should be put in just above the ground line. A layer of Portland cement (that is, cement mixed with water without the addition of sand) spread over the surface of the wall, to the thickness of three fourths of an inch, makes a very effective damp course, as does also a layer of bituminous asphalt laid in the same way. Sheet lead is also used and possesses the advantage of yielding somewhat to the inequalities of the brick or stone, and by that means distributing the weight more equally over the area. Damp courses may be constructed of other materials: in fact anything that is absolutely impervious to moisture and may be applied to the thickness of the walls is suitable.

While the fact that damp courses are very little used can but occasion surprise to those who have had an opportunity of having seen them in constant use, the fact that hollow or cavity walls are so used is even more surprising. Brick buildings, when standing in isolated positions may always be erected with advantage with a cavity wall, because any moisture passing through the outer casing cannot find its way into the interior of the building. Cavity walls are constructed of what are practically two walls, built side by side parallel and at a distance apart of about two inches, the two casings being closely tied together either by brick or by iron ties specially made for the purpose inserted in every fourth course at a distance apart of about two feet six inches. The wall, from the foundation up to the ground line, is built solid, and on the top is formed a damp course upon which two cavities are built. The portion between the cavities thus forms a gutter and is constructed with a fall so as to allow any water that may find its way in to run down the drains with which the cavity is connected. Sheet lead or sheet zinc is inserted over all door and window openings. In case of brick-and-a-half walls, which consists of one brick wall and a half brick wall, connected as described, it will be a subject of consideration as to whether a thicker or thinner casing should go on the outside. As a rule a thicker is preferred on the exterior, as it offers the greater resistance to the moisture finding its way in; but in any case it is well to observe that the floor and roofing timbers should always rest on the thicker casing.

One of the most important advantages of hollow cavity walls is the important influence it has on the temperature of the house. The two inch space of air in the centre of the wall acts as a sort of a non-conductor, and the variations in the atmosphere are felt to anything like so great a degree as they are when the walls are built solid. In other words, houses built with these walls are warmer in winter and cooler in summer.

Another point of construction that may be referred to is the hoop iron bond; this costs so little and adds so much to the strength of the brickwork that it is a difficult to understand why its use has not become general. Hoop iron used for this purpose is about an eighth of an inch thick, and one and a half inches broad. It is laid in every fourth course right along the wall, one row of hoop iron being inserted for each half brick in the wall's thickness; the hoop iron is riveted at the angles. In order to prevent the iron from rusting, it is covered with tar of zinc. The edges are generally jagged with the object of getting a better grip of the mortar, and the hoop iron holds the wall together and assists in distributing weight and is in every way desirable. Its cost is little, and the work it does great.

The writer, in preparing the above, has only referred to one or two of the more important directions in which it would appear that an improvement might be made in the construction of brickwork. Architects and builders have now better facilities for producing perfect brickwork than they ever had in the history of the world; and they should make it a matter of pride to see that the most perfect building material approaches as nearly as possible to perfection in construction.—Arthur Seymour Jennings in *The Brick Builder*.

THE ARCHITECT AND THE CONTRACTOR.

By Edward Hurst Brown.

"O wad some power the giftie gie us,
Tae see oorsel's as ithers see us."

It may be very well for the poet to write that way, but how many of us, I wonder, would feel highly flattered if we really knew what other folks think of us, down deep in their hearts. I have read with interest the reports of the various conventions of master painters as they have occurred from time to time, and while I have seen recorded there many words of self glorification and self satisfaction, as is perfectly natural—unfortunately most of the members seem so carried away with enthusiasm of the moment, that they forget there may be others who do not always look upon the performances of painters and decorators in general through the same rose tinted spectacles that these estimable gentlemen do themselves. Now I hope, my dear readers, if you have not become restive and sought some other article, before reading thus far, that you will bear with me patiently, even if I do say some few unpleasant things. Remember, it is not you I am talking about—it is the other fellow, that poor slouch who never read the *Painter's Magazine*, or the old timer who is so set in his old fogy notions that he never can believe that there is any other way to do a job than the way he learned some thirty or forty years ago. Of course you are too progressive not to fall in at once with an architect's notions, so you won't feel offended at what I may have to say. I have not failed to notice that you are all fond of having a little fling at the architects, not only in your conventions but in the columns of the magazines. Sly digs now and then or perhaps letters complaining of the manner in which these autocrats of the T square dictate to you, and insist that you shall do things as they want, and not as you would perhaps do otherwise. Now, is it not fair play that I, as an architect, may say a few words from the architect's point of view? Don't forget that this much abused personage occupies a very peculiar and delicate position in the erection of the building. The owner goes to him and regards him as a professional adviser, much the same as he consults a lawyer or a doctor. In this capacity he prepares the plans for the work in hand and writes the specifications for it. Here his advisory capacity ends and he becomes the agent of the owner, and, as such, proceeds to make contracts on behalf of the owner and see that they are properly carried out. But, as agent he has no authority whatever to alter in one jot or tittle the drawings or the specifications which he has prepared as the professional adviser. Moreover, he is legally responsible to the owner, in as great a degree as the contractor, for any deviations made by the mechanics employed upon the work. Although in his professional capacity he is responsible for any errors he may make in plans or specifications involving either questions of stability or adaptability to the purposes intended by the owner, as set forth in the instructions given to the architect, still, as agent he has neither power nor authority to modify these plans or specifications in the slightest degree, nor to allow any variation from them without the consent of the owner. When the building is

completed it is the architect who has to bear the blame and shoulder the responsibility for all defects in either workmanship, material, or faulty or inartistic designing. The contractor, more especially the sub-contractor, is rarely thought of by the owner. He is supposed in his work merely to carry out the instructions given to him by the architect.

I have entered into this rather full account of the relations existing between the owner and the architect because I think, as a rule, they are very little understood. Most mechanics regard the architect, in his capacity as supervisor of the work, as having absolute authority to order or permit changes or extra work at his own sweet will without regard to the owner, who stands back of the architect and is the real party to the contract. Hence, they feel little or no compunction about changing the methods or materials designated by the specifications if, in their opinion a better job may be obtained, or one which they believe would be more creditable to them or more workmanlike, relying on the good nature of the architect to permit such changes, if detected by him. As a rule, he is not consulted beforehand. Now, this may be, and frequently is, done with the most honest intentions in the world. The work substituted for that specified may be just as strong, just as durable, and perhaps may be even better, and may cost the contractor more money. But (and this "but" is a very strong one), the contract is not carried out, and though the work may be better, though both architect and contractor may be able to prove it so, the owner can, if he wishes (and sometimes he does wish to do it) bring suit against the architect and recover heavy damages, sometimes many times in excess of the fee charged for professional services. As a case in point I know of a firm of architects who were compelled to spend three times the fee they received on a certain building in order to pay their lawyer for defending them in a suit brought by an owner under circumstances precisely similar. Fortunately, they were enabled to prove to the satisfaction of the jury that the work did not differ materially from that specified, or they would have been mulcted in heavy damages as well. Hence, the architect's position is by no means a bed of roses, and it seems to me to be a little unfair in the mechanic who is called upon to do the work in accordance with certain definite specifications, to set himself up as superior to the contract, to feel that the architect is not treating him fairly in setting forth in definite terms the manner of doing the work, and to complain because the architect particularly calls for certain specified materials. You may say that you, having devoted your lives to a certain trade, ought to know more about it than an architect who has never handled a brush or mixed a pot of paint in his life. Undoubtedly you do about the practical application of the principles which govern your work, though you may not know as much of those principles as the architect whose knowledge of the subject you are trying to treat with contempt.

Doubtless you may come across foolish or carelessly drawn specifications. There are careless, young, or inexperienced architects, just as there are careless, young and inexperienced lawyers or doctors. But remember it is the architect who is responsible for the carelessly drawn specifications, not you. If you are afraid that doing a job in the manner specified will injure your reputation as a painter, you are privileged to refuse to estimate upon the work; or, having done so, you need not sign a contract for it if, in your judgment, the specification calls upon you to do a poor, unworkmanlike job. It is your privilege before entering into a contract to object to any of its terms, and to insist or request, as the case may be, that it be modified before you sign it; but having once signed a contract to do work under certain specifications, whether this contract be a direct one with the owner, or an indirect one through a builder, you are bound both morally and legally to fulfill that contract to the letter, and any variation therefrom without the consent of the other party is dishonest, even though your variation may make what you deem to be an improvement in the manner of executing the work. Now, these are plain words, but when you come to look upon a contract in its full legal aspect, and to view it from every side of the question, you cannot fail to see I am right.

You may think an architect should not specify any particular material to be used, but I say an architect is bound to use his professional knowledge to discover what he believes to be the best material and mode of executing the work to suit the particular case on hand, and to further the interests of his client; not necessarily to make the best possible job in every case, but to make the job best adapted to that special piece of work. If the architect considers his client's interests are best served by the use of a certain kind of varnish, or a certain make of ready mixed paint, he is bound, in duty to his employer, to specify accordingly, and the painter who accepts the contract under those particular conditions is equally bound to see that these materials are used upon the job. I know of one case where, owing to certain personal and business relations existing between the owner of several houses and a certain firm manufacturing a special brand of ready mixed paints, the architect received definite instructions to specify that particular brand. The painter, knowing nothing of the circumstances, and not having much confidence in the paint in question, mixed his own colors, to match in shade the numbers specified by the architect. The consequence was that the architect, having failed to require the compliance with the contract, was held responsible by the owner, though fortunately a law suit was avoided, but the paint manufacturers withdrew a very important business relationship from the owner of the houses. Can any possible process of reasoning justify that painter for having departed from the strict letter of the specifications?

Then again the architect is looked to for the artistic effect of the building, and may specify that the work shall be done in a particular manner, in order to obtain a result which he knows will please him, and his client as well, although it may look rough and unfinished to the mechanic who has been trained up to do the work in a different manner. I know in one case I wished to obtain a certain effect on oak wood, and specified that the work was to have a light coat of paint, which was to be wiped off with a cloth, then followed by two coats of varnish rubbed to a dull gloss. When the work was finished I expected to see the texture of the wood plainly. Judge of my horror when I found that the painter, thinking I had made a mistake in myspecification, and had neglected to specify any filler, without consulting me in any way, filled the oak with paste filler before applying the paint. The whole scheme of the work was changed, and the effect I was trying to obtain was lost. Moreover, a special hanging, which was being made to harmonize with the rough woodwork, seemed strangely out of place with the smooth surfaced wood. At another time I had occasion to paint a certain studio wall, and mixing some Indian red and raw sienna to get just the tint I wanted, gave a light wash of water color over the paper, in such a manner that the brownish gray background showed through the color. I instructed the painter that this was the effect I wanted on the wall, which was to be done in water color. When I next visited the room I was horrified to find a solid coat of color on the walls; the shade was matched, it was true, but the effect was totally different from my instructions. Fortunately, in this case, I could set the men to work with sponges to wash off the superfluous color, and get very near the effect originally intended.

Now don't for a moment think that all mistakes and all disregard to the terms of the specifications are confined to the painters. Other mechanics are just as apt to err, or to set themselves up as superior to the architect. But I do want you to bear in mind that the architect is the responsible head, and that it is better in most cases to follow his instructions than to think your way is best. Don't think that every time he specifies a particular brand of varnish or color, or calls for a special make of white lead, that he is actuated by underhand bribes from the manufacturer. I can tell you, and I know well what I am talking about, that not one reputable architect in a hundred will accept a bribe or an illicit commission as an inducement to specify particular makes of goods, and the manufacturers who attempt to offer such commission usually get sadly left. I do not speak of the self-styled builder architects of small country towns. I don't know what they may do, though I hope they are honest; but I refer to the educated, conscientious, painstaking members of the profession whose practice is in the great cities, and who make up the membership of the American Institute of Architects. If you wish to bring them into sympathy with you, don't sulk in corners, call names, and say you won't play, like silly boys, but get them interested in your associations and your conventions, and you will soon bring about a better relationship between your trade and the architects of the country.—*Painters' Magazine.*

THE LATE W. G. STORM, R. C. A.

THE removal by death on the 1st inst. of the subject of this sketch, has taken from our midst one who has filled a very important place in the architectural work of not only this city of Toronto, but of the province of Ontario, during the last forty years.

He was of English lineage, born at Burton-upon-Strathar, Lincolnshire, England, October 29th, 1826, and came to Canada with his parents in 1830. They left Hull, England, in a sailing vessel on the 29th May, landing in Little York, (now Toronto), in August of the same year. He has therefore spent 62 years of his life in Toronto.

As a youth he was apprenticed for five years to his father, who carried on an extensive business as a builder and contractor, and he early developed a taste for architecture. When 18 years old he was articled to the late Mr. William Thomas, an architect of great taste and skill in Toronto, in whose office he continued for some years.

In 1848 he became associated with the late F. W. Cumberland, Esq., as assistant. In 1849 old St. James cathedral was burned, which was the second destroyed by fire on the same site. Plans for a new church were advertised for, premiums offered, and the first prize was awarded to the plans prepared, it is said, by Mr. Storm, in Mr. Cumberland's office. About the close of 1850 a partnership was formed between Messrs. Cumberland and Storm, and soon they became the leading firm in both city and province. St. James cathedral, the Normal School and the Mechanics Institute buildings were among their earlier work in this city, and among the counties of the province they had to do with many municipal buildings. The erection of the new University buildings in Queen's Park from an important era in the architecture of the city, and with them Mr. Storm was associated from the first in the development of the plans and details and the construction and completion of the buildings. Thoroughness was an important feature in Mr. Storm's work, and owing to this and his practical knowledge gained by him in the workshops of his youth, the Toronto University buildings presented about as perfect a piece of building as could be found on the continent.

The centre building of Osgoode Hall followed close on the completion of the University, and with this Messrs. Cumberland & Storm had to do. Opened in 1860 by the Prince of Wales, it was referred to as the finest law library building in the world. St. James' Cemetery Chapel, St. Andrew's Church, corner of King and Simcoe streets, among others, were his work, and finally the handsome and commodious pile which his eyes just failed to see completed in Queen's Park, the Victoria Methodist College buildings.

At the organization of the Ontario Association of Architects in March, 1889, Mr. Storm was chosen President, which position he held until the second annual convention of the Association which took place in February of the present year. This position was one of peculiar pride to him ; as well as to his associates to have him there. He was indeed an ornament to his profession.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS' EXAMINATIONS.

The following are the examination papers used in the recent examinations of the above Association :

Arithmetic.

1. Add 52 multiplied by 321 to 87 multiplied by 139, divide by 12 multiplied by 7, and subtract 13 multiplied by 8.
2. Divide 19 multiplied by 158 by 44 multiplied by 7.
3. The following deposits are made in a bank :
   $10.00 at 4% for 1 year.
   $16.00 at 5% for 3 years.
   $26.00 at 6% for 8 months.
   What is the amount of interest on deposit ?
4. Bricks cost at the yard $7.00 per M and $1.00 for cartage. What will be the cost of 142,700 bricks at the building.
5. Find the number of rolls of paper required to paper the walls of a room 21 feet square and 10.6 high from top of skirting to ceiling, a roll of paper being 8 yards long by 18 inches wide.

Algebra.

1. Reduce to their simplest forms :
   (*a*). $(a-x)-(2x-a)-(2-2a)+(3-2x)-(1-x)$.
   (*b*). $a^2-(b^2-c^2)-\{b^2-(c^2-a^2)\}+\{c^2-(b^2-a)\}+3(b^2-c^2)$.
   (*c*). $1-\{1-(1-4x)\}+2x-(3-5x)\}-\{2-(-4+5x)\}$
2. Multiply
   $x^2+2xy+2y^2$ by $x^2-2xy+y^2$.
   $x-1$ by $x+1$ and x^2+1.
   $a+b+c+d$ by $b+c-d-a$.
3. Simplify $\dfrac{2(x^2-\frac{1}{4})+\frac{1}{2}}{2x+1}$
4. Reduce $\dfrac{x^3+3x^2-4}{x^3-1}$ to its lowest terms.
5. Solve the equations :
   (1). $2x-\frac{1}{3}=75\ (3-2x)+\frac{1}{2}x$.
   (2). $2/7x+\frac{1}{6}\ (x-1)=x-4$.
   (3). $\frac{1}{6}x-1\frac{2}{3}=83/5+2(3/5+2(3/5x-1)-(x+8)$.

Mensuration.

1. A trapezoidal field has two parallel sides whose length are 8200 yds. and 6190 yds. respectively. The perpendicular distance between the sides is 220 yds. The rental of the field is $750.00 per annum, what is the rent per acre of 4840 square yards ?
2. The height of a precipice standing 20 feet back from the side of a river is 112 feet and a line 200 feet long will reach from the top of it to the opposite bank, find the width of the river.
3. A building 210 feet long, 64 feet wide has a slate pitched roof 32 feet high measured perpendicularly hipped at a similar angle to sides, at both ends. How many squares of slating of 100 sup. ft. will there be in the roof ?
4. A boundary wall is 940 feet long, 10 feet 6 inches high and 2 feet 4 inches thick, how many cube yards of stone will the wall contain ?
5. A gallon of water contains 277.2 cub. inches and weighs 10 lbs. avoirdupois, find the weight of 3 cubic feet of water in ounces.

Euclid.

1. Any two sides of a triangle are together greater than the third side.
2. If a straight line falling on two other straight lines make the alternate angles equal to one another, the two straight lines shall be parallel to one another.
3. Parallelograms upon equal bases and between the same parallels, are equal to one another.
4. Divide a given straight line into 2 parts so that the rectangle contained by the whole and one of the parts may be equal to the square of the other part.
5. If a straight line be divided into any two parts, the rectangle contained by the whole and one of the parts is equal to the rectangle contained by the two parts together with the square on the aforesaid part.

Besides the foregoing there was a composition on a subject given by the examiners. Also freehand and linear drawing from copy.

A curious suit has been entered by the Queen of England in the New York courts to recover a cargo of asphalt recently brought from the island of Trinidad, and sold to the Standard Asphalt Company of New York. It seems that the island of Trinidad is the property of the British Crown. The principal source of asphalt in the island is the celebrated Pitch Lake, which is practically a mass of asphalt, or rather, bituman. This is collected by a simple process of driving carts upon the surface of the lake, which is solid enough to support them, and shovelling the material into them ; and the price, on the island, of the asphalt so collected is about a dollar and a half a ton. The lake is entirely Crown property, but there are secondary deposits of asphalt in other parts of the island, which are least, or otherwise conceded, to private parties. According to the claim of the council for the Crown, the deposits of asphalt under private control are nearly or quite exhausted, and their proprietors have taken to replenishing their supplies of the material by poaching on the Queen's property. It seems that this reprehensible practice has become so general of late that the Crown officers detain, where they can, all vessels leaving the island with cargoes of asphalt until it is ascertained whether any of the asphalt was stolen from the Queen or not ; but it is alleged that, in the present case, the vessel succeeded in escaping without being searched. On the other hand, the respondents assert that, as the Crown imposes an export duty of a dollar and a half a ton on all asphalt taken from the island, the Queen has already received the full value of the cargo, and that they believe the suit to be merely a contrivance to annoy them, devised by a rival asphalt company, which has made an agreement with the Crown officers, not to take asphalt from Crown lands.—*American Architect.*

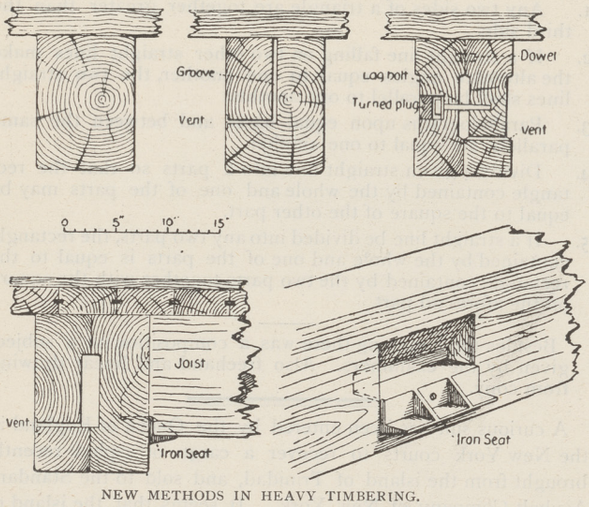
NEW METHODS IN HEAVY TIMBERING.

The following article on this subject from Mr. Frederic G. Corser, architect, Minneapolis, Minn., appears in a recent number of the *Engineering News* :

The great success of the building now much in vogue for warehouses and factories, known as the "mill construction," and the probable extension of some features of this system to other classes of buildings than those mentioned, has been productive of more or less study of the subject of timbering. If we except the efforts made within a comparatively short time to reform the timbering customary in these factories and storehouses, we must look in vain for recent examples of even tolerable timber-work. All the traditions to be acquired by the present generation of builders lie in the direction of rough, cheap work, intended to be concealed from view. No builder of this day thinks that the timbering of the ordinary building is a thing to be proud of under any circumstances. The carpenters of the day will look over the old works on the subject with rather more pity for the simplicity of the old builder, which led him to waste his time on the splendid framing shown, than of admiration for that framing.

Another factor in the decline of timber-work is the cheapness of sawing and dressing lumber in our time, which has increased the tendency to hide the actual construction by boxing or casing it in. When to this we add that the properties of timber used transversely are not generally well understood, we find sufficient causes for a decidedly low state of the art of timbering. However, with an amount of ingenuity and technical skill unknown to former times, seeking employment in every field, it were indeed a pity if the art of timbering were overlooked ; and now that there are such good economical reasons for the use of heavy timbering, left in full view, we may look to see the objectionable features overcome.

The accompanying cuts give some things which, as far as I know, have not been used outside of my own work, and which



NEW METHODS IN HEAVY TIMBERING.

are submitted as in the right direction. The drying of large timbers being a slow process, proceeding from the outer and newer tree growth which shrinks most, to the inner and older wood which is more stable, we get under the ordinary conditions several unsightly cracks, due to the strains set up by this unequal drying. Aside from their unsightliness, these cracks are often of considerable damage to the timber from the standpoint of strength. The boring of posts from end to end has long been done, and when the holes thus made are of considerable size, and vented by transverse holes at top and bottom, the trouble is overcome to some extent. Were it practicable to bore the floor timbers in this way, the benefits would be even greater than to the posts, because in the timbers used transversely we could bore out a relatively large part of the centre without weakening them. However, boring requires special machinery, not to be found around saw-mills or planing-mills, and there are limitations to the length of the timbers that one can get bored. After trying for some years to get manufacturers of lumber to put in the necessary machinery for boring, I gave it up.

A deep groove may be worked in from the upper edge, a circular saw being specially set for the purpose. This method is open to the objection of destroying a few of the fibers opposed to the compressive strains, but it is even more efficient in reducing the tendency to crack than is the boring. The preservation from season-cracks would doubtless in some cases prevent a loss of strength that would offset the amount taken away by the grooves.

An old way of reducing the tendency to season-cracking consists in splitting the timber through the center with the saw, turning the outer sides inward, and bolting. This was a favorite prescription by Viollet le Duc. It puts the older and more permanent part of the tree-growth outward, and as this is less liable to shrink than the sappy newer growth, it not only relieves these seasoning strains by so much as would naturally follow from dividing the timber, but it also exposes the part of the timber which cracks least.

There are also other advantages in thus making up the timber in two parts, among which is the opportunity given to inspect the heart of the tree ; this portion being, as is well known, subject to decay which does not manifest itself at the surface. Another advantage of using the timber of two parts is the fact that in the operations of the modern sawmill, larger timbers can in this way be sawn from a given diameter of logs, Still another gain to the building is to be found in the greater progress of the seasoning process in the interval between the cutting of the lumber and its final assembling in place in the building.

Not long since it occurred to me that possibly broad grooves or panels might be worked in the sides of the pieces thus proposed to be bolted together, the operation being done at the planing-mill at the times of dressing of lumber. Upon enquiry, I find that the planers in use at these mills for doing the bulk of their work may be easily modified to work these channels, and I have had estimates for doing it at a very low figure.

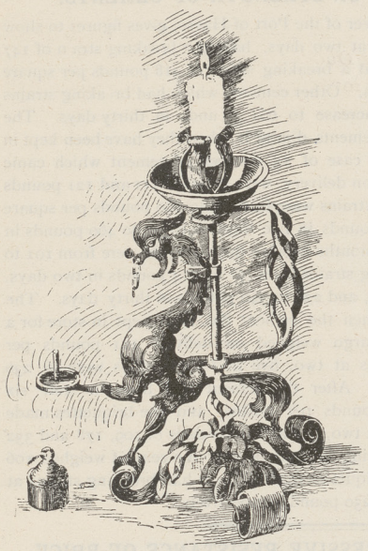
As grooves or panels of about the proportion shown in the cuts may be made without taking from the strength of the pieces when subjected to transverse strain, this form becomes desirable for several reasons. The seasoning of the timber prepared in this way would be accomplished in a fraction of the time required by a solid timber ; the panelling would so reduce the pieces at the center as to remove the tendency to season-cracks ; considerable weight would be saved in freighting and handling on the building ; the interior could be dried while the under side of the timber, being practically solid, would resist fire well, and if the outer sides were also panelled, it would do much toward relieving the appearance of the timbers, by introducing lines that would in a measure take the attention from the unsightly features of common lumber. In fact, this treatment of timbers will go far toward making open timber-work desirable in other classes of buildings than factories and warehouses. Floors built on this principle are much to be desired in schools, for instance, where by their substitution for the common thin joist and concealed construction, and by the use of open-timber roofs of suitable detail, a practically fire-proof building may be obtained at less cost than one of the kindling-wood structures so nearly universal.

I am indebted to Mr. C. J. H. Woodbury for the suggestion that the small vent-holes be placed at a low enough level to drain the inside of any water that might get into the centre during or after building. For bolting the halves of the timber together, lag-screws are used as shown, because they would not become so loosened by the shrinkage of the wood as would the common bolts running clear through. A few dowels might be inserted with profit in the upper part of the girder liable to unequal loading, as the planking, being parallel with it, would not be of assistance in distributing the load over the two halves. The dowels, replacing fibres subject to compressive strains only, would not take from the strength of the beam.

The iron stirrup, so commonly used for the support of timbers meeting at right angles, as when heavy joints are carried at one or both ends by girders, is far from an ideal way of accomplishing the desired result. It is clumsy in appearance, if not actually so in manufacture ; it usually gives a rather poor bearing for the joists, while the shrinkage of the joist eventually leaves the top of it considerably below the top of the girder. The iron seat shown in the cut is designed to overcome these faults in a degree.

As we approach the neutral axis of the timber in which the mortise is cut, we find the fibers less and less strained under a load, so that we may remove a part of the timber without weakening it, provided we have enough wood at this point to bear the small strains that the timber will be called on to withstand at the level of the mortise. If in this mortise we place a casting of the form shown, and tenon the joist to fit, we shall get a bearing of the joist much better than that given by the stirrup ; the arrangement will be much less unsightly, and nearly all the old trouble of shrinking away from the common level at the top, which gives so much trouble where stirrups are used, will be overcome.

DECORATION AND FURNITURE



OLD CANDLESTICK.

DEVELOPMENTS IN DECORATION.

A well-known writer says: "Art moves in cycles of styles. At one time a separate style in blended form is resurrected; at other times we witness blended styles. New combinations of old styles may create a novelty—with nothing new in principle—new only in arrangement, and with no great variety in details. We have few decorative forms that do not retain some element of a preceding period." To this, says *Furniture and Decoration*, we cannot dissent. Those of us who have given any attention to the origin and composition of style in decorative art will readily agree that in the present era there is little or no purity; although we may be compelled to call such by, or adopt, some classical name for our purpose, the intent is not to deceive, but the designer merely wishes to convey the idea that the scheme was not to faithfully decorate in exact reproduction of some period or era of time, but simply to avail himself of the advantages of that peculiar style, with such adaptations, in form and color, discarding here, appending there, modifying this, strengthening that, and reserving the right to make such changes as will best accord with the surroundings, improvements, temperament and culture of to-day.

We endeavour to be as classical as our knowledge and resources of material will permit. We all know that to consistently decorate in say the "Louis XV.," or "Japanese" style, if we at all succeed in obtaining the genuine article, we do so at a great outlay, and then we may venture the opinion that our stained glass, mantel, and fire-place will be very modern, and the exterior architecture will be composite "Romanesque."

Although we are utilizing all styles in our present decorations, the predominating ones have been adapted from the French period of the "Rococo," the different kings, Louis XIV., XV., XVI., and the Empire. The revival of these style shas chiefly been confined to interiors, while the "Cinque Cento," "Italian Renaissance," "Romanesque," "Early English," and "Elizabethan," in composite form with "Celtic" and "Byzantine," as well as the "Adams," are extensively employed both for interiors and exteriors. Modern inventiveness joins hands with ancient picturesqueness, and produces varying and unique results. This we see constantly exemplified in the interior as well as on the exterior of our buildings.

A gratifying change is being made by our architects. Formerly, when the dwelling was constructed by the builders, they considered their work done, and their interest ceased upon its completion.

The coloring used in decorating a modern dwelling is always, consciously or unconsciously, controlled and dictated by the prevailing fashion. To gratify its whims, new shades and tints must constantly be created. These colors will appear in the latest textile fabric, and necessarily are introduced in the surroundings. The painter must become acquainted with these and introduce them in his scheme of coloring. In the selection and arrangement of his colors his degree of taste, refinement, and art will be seen. He may possess all necessary scientific and technical knowledge of his calling, his treatment with the brush be skilful, his judgment of design and proportion of same be perfect, but the entire effect may be destroyed, or at least marred, if the coloring does not receive the proper attention.

The successfully-decorated room receives its maximum amount of work, not in labor or material, but in thought and study. A certain shade in one place will appear entirely different when exposed and contrasted to different lights and surroundings. "Seeing is believing"; this trite saying aptly applies to a decorator studying a color effect.

The covering of walls with silk, tapestry and cretonne is on the increase for finer wall hangings. As a rule the effects are very beautiful, the good coloring and softer nature of the material easily according them with their surroundings; but its perishability, the ravages of moths and dust, the fading of the aniline dyes, will prevent the adoption of this material for permanent decoration.

Truly there is a soul in our art, or at least a finer feeling, not gifted to all, which must be disciplined and cultivated, for to be able to discern those subtler tones, to appreciate those minute differences in tints and shades, to feel the effect of warm and cool, or to distinguish between chaste and vulgar colors, there is something more than the technique of a craft required to be thus affected.

The more we are surrounded by beautiful and harmonious forms the more exacting becomes our natures, the greater our requirements, the higher our ideal. It is our education, our intelligence, our culture, that creates this natural demand for a higher art. We know there is no finality in art, but we must endeavour, on all occasions, in return for our labors, to attain the greatest amount of permanent beauty, and to strive, constantly strive, to reach the highest excellence, the position occupied by our old masters of the Fifteenth and Sixteenth Centuries.

The use of copper in decorative metal work is largely on the increase, by reason of the ease with which it can be used in various electroplating processes. The electrotyping of metal has been carried so far that entire shop fronts are constructed by this process. One of the ceilings of the Equitable building is made of electroplated copper on wood, which exhibits the capabilites of this beautiful method of interior decoration.

A good frieze for the wall was produced recently by a firm of decorators in the following way: A frieze was marked out on the wall by bands of narrow moulding two-and-a-half feet apart, thus preserving the depth of frieze. The paper of the frieze was the same as the paper on the rest of the wall, and along this frieze were arranged, at distances of one-and-a-half yards apart, and located at points about three inches below the top moulding of the frieze, small brass lions' heads, and from these heads was draped a chintz festooning all round the room.

The Ontario Department of Public Works has removed to the new Legislative buildings in Queen's Park, Toronto.

To measure plumber's work, says Lockwood's "Builders' Price Book," take the lead as cut and laid, by the superficial foot; the quantity of feet multiplied by the weight of the lead per foot, and divided by 112, will give the required weight.

In the case of a mortgagor who moved a house from the mortgaged premises to another piece of land owned by him but not covered by a morgage, the Supreme Court of N. Carolina held that the mortgagee's lien on building was not affected, and decreed a sale of the house on its new *situs* with leave of the purchaser to remove the building, there being no question as to the ownership apart from the claim of the mortgagor.

The famous "Leaning Tower" of Pisa, Italy, so celebrated in the annals of the world as one of the greatest of its many wonders, was begun in the year 1152, but was not finished until after two centuries had come and gone. It was erected as a sort of triumphal tower to celebrate the victory of the Pisans and the Normans over the Saracens, the two former having allied to drive the latter out of Italy. The fact that this old relic is now in the market and offered for sale to the highest bidder makes this item timely and appropriate. The old tower is circular in shape, 100 feet in diameter, 179 feet high, and is of pure white marble. It is divided into eight stories and has galleries at each story which extend entirely around it. As above mentioned, the entire structure is of massive marble slabs, the weight of which gives it a decided over-toppling look, the top hanging out, as it does, sixteen feet over the foundation.

SANITATION AND LIGHT

HOUSE DRAINS.

We can remember, says the *Contract Journal*, when it was customary for architects to specify nothing less than 9 in. for the internal diameter of the main drain to an ordinary house, and sometimes a 12 in. pipe was thought necessary for a large mansion or warehouse. We are glad to think that smaller pipes are more generally adopted now. Yet we occasionally meet with architects who still cling to the prejudice in favor of large pipes, and some two years ago we knew a vestry surveyor who insisted upon a 9 in. main drain being laid to a common lodging-house containing some half-a-dozen water-closets, all discharging into a single 6 in. trough. To those who reflect upon the rapidity with which water finds its level, the danger of deposits being left in a 9 in. pipe is obvious. A 9 in. circular pipe, half filled with water, holds one gallon in every 4 in. of length, so that the orthodox two gallon flush from a single closet soon distributes itself in such a shallow stream as is totally insufficient to carry away the soil. A 6 in. pipe, half full, carries a gallon of water in 1 ft. 8 in. of length and a 3 in. pipe, half full, carries the same quantity in 3ft. 4 in. Of course it is advantageous for the soil to flow in narrow, deep channel. This is a reason in favor of pipes of an egg-shaped section, though the care required in setting the axis of the oval section vertical increases the cost of laying the pipes. The danger of small pipes becoming choked through an excessive flow of soil has been exaggerated. Prof. Corfield has found that even in large country mansions, with large areas and outbuildings, no main soil drain need ever be more than 6 in in diameter; and in Gwilt's "Encyclopæa of Architecture." (1888) there is instanced the case of a 10-roomed villa where a 3 in. main drain was used without inconvenience for many years.

The choking of a drain is caused not so much by an excessive flow of soil through the pipe, as by an insufficient or badly regulated flow, which causes deposits to accumulate. It has been observed that when a water-closet is situated low down, near the head of the drain, the latter is liable to become choked. This occurs through the gradual accumulation of solid matter. It certainly is preferable when the water-closet is situated at some height above the head of the drain. The advantage of this consists less in the velocity acquired by the soil in travelling down the soil-pipe, than in the breaking of the soil matter into small fragments, which are held suspended in the water. The velocity is useful to carry the soil through the trap, and after that a slight fall suffices to ensure a sufficiently rapid flow.

An insufficient fall to a drain allows time for solid matter to settle, because the water does not flow rapidly enough. On the other hand, it has been found that if the fall is too great the water runs away, leaving deposits of soil. According to Hurst, a velocity of 2ft. per second is the smallest that will keep a drain clear, but 3 ft. per second is required for a house drain. It has been calculated that this velocity can be obtained in a 4 in. pipe half full, with a fall of 1 in 100; in a 6 in. pipe, with a fall of 1 in 150; and in a 9 in. pipe, with a fall of 1 in 225. But there is great divergence of practice in arranging the falls of drains. Some architects favor falls of 1 in 60, some 1 in 40, and others 1 in 30. The regulations made by vestries exhibit differences of opinion on this subject. One London vestry states the minimum fall for drains at 1 in 60, another at 1 in 48, and a third at 1 in 40. We rarely find measures taken to guard against an excessive fall. We know one London vestry that requires the fall to be not less than 1 in 40, and provides that the whole of the available fall is to be made use of. The maximum fall may, therefore, be anything, and it may easily be such as to allow the water to flow away, leaving deposits of solid matter in the sides of the pipes. A plentiful flow of water is far more effective in cleansing a drain than a rapid fall, and the two-gallon flush, to which we are limited by law for each water-closet, ought to be supplemented by a further supply. A rain-water drain may advantageously be turned to account in flushing soil drain, especially if connected near the head of the latter.

A report obtained currency two or three weeks since that an association of manufacturers of plumbing supplies was to be formed to restrict credit, and in other ways to place the trade on a more satisfactory basis. Enquiries of leading manufacturers elicited the reply that they know nothing about such a movement.

MANUFACTURES AND MATERIALS

EFFECT OF TIME ON STRENGTH OF CEMENTS.

Baron de Rochmont, engineer of the Port of Havre, gives figures to show that the strongest briquettes, at two days, having a breaking strain of 147 pounds to the square inch, had a breaking strain of 318 pounds per square inch, after a period of 30 days. Other cements which had breaking strains of 157 pounds at two days increase to 661 pounds in thirty days. The weight or tensil strength of cements diminish when they have been kept in stock for some time. In the case of 15 cargoes of cement which came under his notice the weights, on delivery, were between 111 and 121 pounds per bushel, and the breaking strains were from 75 to 160 pounds per square inch in two days, 160 to 289 pounds in five days, and 339 to 460 pounds in thirty days. After being six months in store their weights were from 101 to 108 pounds, and their breaking strains from 38 to 114 pounds in two days, 112 to 195 pounds in five days, and 234 to 340 pounds in thirty days. The fall in weight and strength when the cement has been kept in store for a year is still greater. One cargo weighed on delivery 111 pounds per bushel, and its breaking strains at two, five and thirty days were 96, 236 and 271 pounds respectively. After the cement had been in store six months its weight was 106 pounds per bushel, and the briquettes made from it had breaking strains at two, five and thirty days of 109, 178 and 332 pounds respectively. After being in store a year the cement weighed 106 pounds per bushel, and the briquettes made from it had breaking strains at five and thirty days of 73 and 250 pounds respectively.

NOTE ON THE COMPRESSIVE RESISTANCE OF BRICK.

The writer has previously called attention to the fact that the flatness of the pressed surfaces greatly affect the crushing strength of cubes of brick or stone. The present note is written to present the results of some experiments made to determine the effects of different methods of preparing the pressed surfaces to the test specimens.

In testing some paving brick, the writer made some preliminary experiments by preparing the surfaces in five ways, viz.: 1, grinding as nearly flat as possible upon the convex side of an emery stone, and crushing between self adjusting, parallel, cast iron plates; , removing the irregularities of the surface, and crushing between blotting paper; 3, removing the irregularities of the surface, and crushing between straw boards; 4, removing the irregularities of the surface, coating with plaster-of-paris and placing under slight pressure until set (12 to 24 hours), and then crushing; 5, coating with plaster-of-paris which was afterwards ground down on a sand-paper disk, to the surface of the brick, so as to leave a minimum thickness with a perfectly flat surface, and then crushing.

After a considerable number of experiments, it was decided that there was no great difference between the first three methods, while the difficulties in applying the last two were so great as to render them worthless. With a grade of brick which was quite uniform in quality, the first three methods gave 7,000 to 9,000 pounds per square inch as the crushing strength of cubes. The fairly close agreement of the results was considered satisfactory evidence that the method employed secured the full strength of the brick. Subsequently the writer decided to determine the strength of cubes when pressed surfaces were prepared with the greatest care. The samples were prepared on a rubbing bed at a marble dressing establishment, by the ordinary workmen, with instructions to secure perfectly flat surfaces. The brick were of the same grade as those referred to above, and many of the samples were the second halves of the brick used in the first experiments. The strength of the carefully prepared cubes ranged from 16,000 to 21,000 pounds per square inch, and averaged a trifle over 18,000.

The conclusion derived from the two series of experiments is that an almost imperceptible difference in the flatness of the test specimens makes a very great difference in the strength. Obviously this difference is greater the harder and more brittle the brick or stone. It is perhaps well to repeat that tests of compressive resistance of blocks of stone or brick are useful only in comparing different samples, and gives no idea of the strength of masonry constructed of these materials.

It is interesting to note that Rankine and Trautwine, standard British and American authorities, in editions of their engineers' manual published a few years ago, give the crushing strength of the best brick at 1,100 and 4,000 pounds per square inch respectively, while there has recently been tested in the university testing laboratory three lots of brick which averaged from 15,000 to 18,500 per square inch. The difference is probably due mainly to improvements in the manufacture of brick. The crushing strength of granite, when tested under similar conditions, is from 12,000 to 20,000.—IRA O. BAKER, Professor of Civil Engineering, University of Illinois, in the *Technography*.

The Central Bridge Works, of Peterborough, has been succeeded by the Central Bridge and Engineering Co., incorporated, with a capital stock of $200,000. The company will manufacture steel and iron bridges and structural iron and steel for all purposes.

Messrs. Merchant & Co. are calling the attention of their customers to the fact that they have ceased to handle "Gilbertson's old method" brand of roofing plates, the quality of which, in the opinion of many of their customers, has deteriorated of late. They are now offering a heavier and better plate manufactured in their own works in Philadelphia.